A PRAGMATIC APPROACH TO STREAM RESTORATION

Robert Q. Lewis
University of Birmingham

UNIVERSITY OF BIRMINGHAM

The Anthropocene, our present age, faces the task of remediating environmental degradation that follows from rapid industrial growth and a shift towards consumer-based economies. Ecological restoration is a discipline and practice that attempts to mitigate environmental damages with a hope that restorative measures can repair ecosystems subject to ongoing and/or prior degradation. Our current Western neoliberal sociopolitical economic structures have popularized the use of ecosystems services (ES), in general, and Natural Channel Design (NCD), specifically as a means of stream restoration, as the methods employed to mitigate these damages. One reason being that ES and NCD have correctly identified that science, society, economics, and politics are inseparably linked. However, the problem is not knowing how to link science and social goods, rather it is that we do not agree on what is a social good; this "epistemic problem has a moral complexity" for which we lack the understanding of whether our choices, in the end, are good or bad [1]. In other words, we lack the appropriate knowledge to accurately assess the consequences of our current restorative actions and their future impacts.

Natural Channel Design is an ecological restoration and stream mitigation method that stems from the scientific and ethical tenets and approach of (ES). NCD is widely employed by government agencies and private industries as the primary method for restoring rivers, especially in the Eastern United States. Ecosystem services are a market-based approach that seek to monetize the value of ecosystems as they relate to anthropocentric concerns. Proponents of ES argue that the monetizing of ecosystem goods and services is a means to secure more efficient trade-offs between societal demands and scarce resources [2]. Therefore, arguments for ES seek to balance societal demands for cheap fuel, goods, and development with the notion that societies also need clean air, water and ecosystem stability. But are economic markets the best evaluators of ecosystem values?

In response, I offer American Pragmatism as an alternative approach to ES and NCD, specifically the pragmatism of Charles Peirce. I argue that economics is a deficient means to assess ecosystem value and offer a pragmatic approach as an alternative approach for valuing ecosystems, particularly fluvial systems.

Pragmatism, which began as an American philosophical movement by Peirce and others, attempts to answer the moral complexity posed by the epistemic question of 'goods' by asserting that 'goods' are fulfillment of 'ends'; 'ends' being the outward expression of function/purpose. Pragmatism, being foremost a theory of truth, as Peirce contends, is a method for arriving at the true meaning of "any concept, doctrine, proposition, word or other sign" [3]. Therefore, a pragmatic approach to stream restoration is predicated on ascertaining the truth of what it means to say something is a stream. Peirce further defines pragmatism as – "the principle that every theoretical judgement expressible in a sentence in the indicative mood is a confu-

sed form of thought whose only meaning, if it has any, lies in its tendency to enforce a corresponding practical maxim expressible as a conditional sentence having its apodosis in the imperative mood". In addition, Peirce claims that pragmatism is an "inseparable connection between rational cognition and rational purpose" [3]. All to say, if I desire y (and I believe y to be true), then I should do x to achieve y. If what I mean by a stream y is that it has x traits, then any restoration project should seek to restore traits x so that stream y emerges out of the relationships of those traits interactions.

The word 'stream', 'river', or a blue-line on a map are signs which stand in a semiotic relationship with their object and our perception of what it means to be a stream. To claim that an object is a stream is to make ontological claims about its necessary and accidental properties. Peirce's early definition of the pragmatic maxim bears this out – "Consider what effects, that might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object" [3]. Therefore, to explicate what it means to be a stream is to systematize the necessary and accidental properties of a fluvial system. Necessary properties (universals) are moving water, bed load and suspended load, and supporting flora and fauna, etc. Accidental properties (local) are secondary properties such as bed material, headwater vs. valley bottom stream, flora and fauna species, etc. A stream is not a top-down process; simply building a channel and providing in stream structure (as NCD proposes to do) cannot encompass all the processes and interactions that define a stream. Rather, a 'stream' is a bottom-up process which emerges from the necessary and accidental properties of its members. Therefore, a pragmatic approach to restoration is predicated on the normative functions of a system.

In contrast, supporters claim ES provides a context for raising environmental awareness, consideration of environmental accounting, designing incentives and aid in quantifying economic compensation, during the litigation process, in light of environmental damage [4]. Yet ES focuses on the benefits that humans derive from an ecosystem [5] and, by design, fails to

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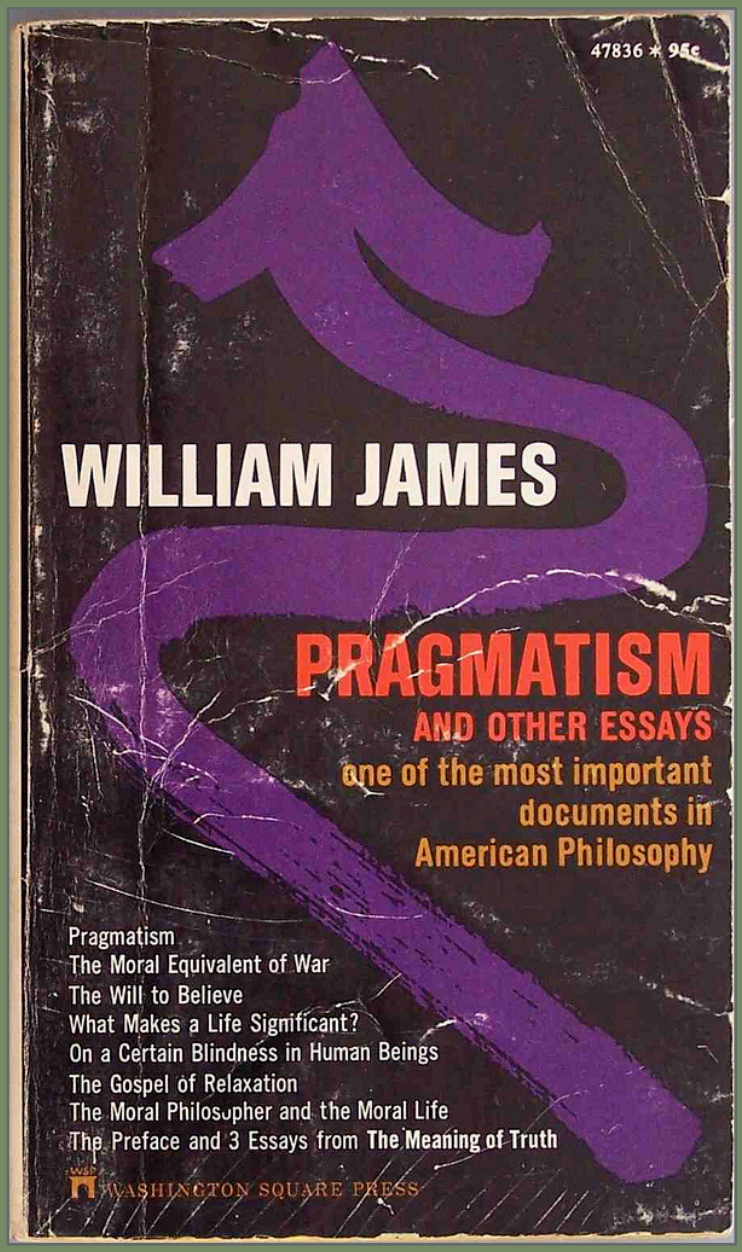

"Pragmatism, being foremost a theory of truth, as Peirce contends, is a method for arriving at the true meaning of 'any concept, doctrine, proposition, word or other sign.' Therefore, a pragmatic approach to stream restoration is predicated on ascertaining the truth of what it means to say something is a stream."

consider whether an ecosystem is beneficial in and of itself (intrinsic value) [6]. Even trait-based ES, which recognizes the complexity of ecosystems, opts for the generalization and simplification of ecosystem selected traits which are beneficial to humans [6]. Consequently, the ability to simplify and generalize makes ES adaptable and appealing to our current economic model — neoliberal capitalism.

The claim that the monetization of ecosystems can better account for how ES ought to be utilized appears untenable under our current economic system. Neoliberalism, generally speaking, is the prioritizing of individual needs over the collective, towards a universal expansion of competitive markets into all areas of life, including economics, politics, and society. Neoliberalism promotes the commercialization and privatization of science in order to support a marketplace for ideas and has shifted the focus of many environmental regulatory bodies. The neoliberal philosophy of competitive markets has caused regulators not only to ease environmental regulations perceived as hindrances on market growth but to adapt market-based solutions to environmental problems (e.g. cap and trade, and mitigation banking) [7].

Ecosystem services and NCD benefit in popularity because of their ability to translate value in the context of capitalist markets. Lave [8] attributes the widespread acceptance of NCD by regulators to its ability to adhere to the "central tenet of neoliberalism," namely the epistemological "claim that the market is the best information processor, [and] the only entity capable of accurately comprehending the world." Stream restoration, designed to aid in meeting state and federal water quality standards, is a billion-dollar-a-year industry [9] seeking to restore streams and their floodplains, which provide beneficial ES deemed necessary for human well-being [10].

What NCD provides is a metric that allows regulators and practitioners to assess restoration practices. As Lave points out, NCD is the only step-by-step guide which makes checking practices, such as channel reconfiguration, possible [8]. The widespread use of NCD despite the substantial number of academics in the geosciences who argue this method is inadequate to address the complex dynamics and open nature of riverine systems is evidence of NCD's ability to ingratiate itself to neoliberal markets [8,11,12].

Natural Channel Design assist the infiltra-

tion of neoliberal markets into environmental management via its use in stream mitigation banking. Stream mitigation banking attempts to offset stream degradation from new development by banking credit through the restoration of previously degraded streams at another location. Lave claims that NCD is the central metric for determining the condition of restored and degraded streams and without NCD stream mitigation banking might not be possible. Lave also contends that NCD success with, and the increase of neoliberal ideas into science management, has led even opponents of NCD into more market-focused research. While the neoliberal agenda continues to advance, many question the validity of ES methods, such as NCD, to address environmental woes using market-based approaches [8].

The use of cost-benefit-analysis as a means to assess the environment assumes that market-based approaches adequately capture ecosystem value [13]. Conversely, ES does not place a value on ecosystem constituents with no known anthropocentric benefits; instead, it suggests that economic value is the desired end rather than protecting ecosystems [13]. Harizaj states that "monetary evaluations represent always finite numbers. However large they could be, these numbers remain always smaller than the infinite value the world ecosystems have for humanity" [14]. In other words, there is no monetary value that can capture the importance of clean air, water, food, etc. for human flourishing.

Capitalism is not egalitarian when it comes to the ecosystem; capitalism is premised on the amassing of wealth and profit. Magdoff and Foster contend that multinational and transnational corporation's loyalty is to their bottom lines and, therefore, continue to exploit resources and people wherever they find them; much of this is done with help from political leaders who see it as their duty to further corporate interests, through market growth, as the best means to serve public interest. Furthermore, they maintain that the greenwashing of corporations and public consumption of 'green' technology allows corporate exploitation of resources and people [15].

ES supporters believe that "on balance it is safe to say that the exploitation of ecosystems has greatly benefited humankind and increased human well-being, but if humankind continues this way the costs of overexploitation are likely to exceed the benefits at some point" [16]. First, there is an unstated assumption that our current level of existence is in some sense optimal (Western culture), that other cultures and civilizations past and present are in some sense inferior. Second is the idea that we have not already reached the point when our benefits no longer exceed the costs. As Madoff and Foster point out, individual greed drives capitalism through consumption, and human needs are met as a by-product [15]. Ecosystems are not consumers and therefore their needs are not met as a by--product of consumption.

Therefore, ES methods, such as NCD, in their attempt to direct sociopolitical outcomes, using market strategies are, in some way, facilitating environmental degradation – if not through neoliberal policies than due to their inability to fully assess the moral complexity of decisions related to ecosystem dynamics. For example, Lave states that NCD uses non-deformable structure (i.e. boulders, wood structures) as a means for creating channel equilibrium (stationary channels) and fails to address steam biology or ecology in the restoration practice. Conversely, a pragmatic method would incorporate meandering channels as well as biological and ecological conditions as necessary properties. NCD frequently claims that when stream bank erosion is threatening to collapse a barn into the river, there is no time to study it, rather, immediate action is required [8]. Pragmatism is sympathetic to NCD's dilemma; however, stream bank erosion is a natural symptomatic response to upstream processes, and pragmatism would argue that maybe the barn needs moving, not the bank needs hardening. Pragmatism also differs from ES on principles. Where ES would seek to restore a stream in order to provide anthropocentric benefits, pragmatism strives to restore a stream to its own ends, and in doing so considers anthropocentric benefits as possible traits alongside other accidental properties constituted into what it means to be a stream.

Instituting the pragmatic method as a means

for stream restoration will inevitably require a paradigm shift in restoration ecology. Pragmatism, unlike ES and NCD, does not fit within the tenants of neoliberal market-based environmental management. Pragmatism intends to promote restorative practices that recover what it means to be a stream. This method is closely aligned with the academic geosciences which promote function over form. Pragmatic stream restoration may provide more flexibility in the restoration practice as it recognizes that, in some cases, what is needed is not instream channel reconfiguration; rather, out-of-channel solutions (for buildings, run-off control, etc.) might be the better place to focus restoration methods and expenses.

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Marsh Creek Restoration at Creekside Park, City of Oakley, before (left) and after (right) resotration (credit: Restoration Design Group).